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BAKER (MICHAEL) JR INC BEAVER PA F/G 13/13
NATIONAL DAM SAFETY PROGRAM, COBURN DAM (INVENTORY NUMBER VA 03--ETC(U))
APR 81 J A WALSH DACW65-80-D-0032

F/G 13/13

ITEM NUMBER VA 03-
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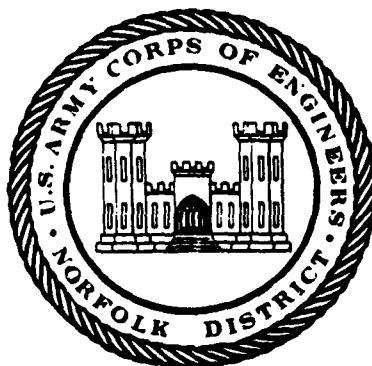
Name of Dam: Coburn Dam

Location: Caroline County, State of Virginia

Inventory Number: VA 03340 ✓

PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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PREPARED FOR
NORFOLK DISTRICT CORPS OF ENGINEERS
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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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NAME OF DAM: COBURN DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Coburn Dam
State: Commonwealth of Virginia
County: Caroline
USGS 7.5 Minute Quadrangle: Ruther Glen, VA
Stream: Unnamed Tributary to Polecat Creek
Date of Inspection: 14 January 1981

BRIEF ASSESSMENT OF DAM

Coburn Dam is an earthfill embankment 17.0 feet high¹ and approximately 350 feet long. The dam is located in Caroline County, approximately 1.5 miles northwest of Ruther Glen, Virginia. The dam is owned by the Ramada Inn, Box 104, Ruther Glen, VA, represented by Mr. Paul Walfield, co-owner and manager. The dam is used for recreation. Coburn Dam is a "small" size - "significant" hazard structure as defined by the Recommended Guidelines for Safety Inspection of Dams. The dam and appurtenant structures were in fair condition at the time of inspection. Deficiencies found during the field inspection and office analyses will require remedial treatment. A stability check of the dam is not required.

The principal spillway is a 54-inch diameter bituminous coated corrugated metal pipe (BCCMP) acting as a fixed crest riser connected to a 30-inch BCCMP that passes through the embankment. The emergency spillway is a vegetated earth trapezoidal channel located on the left abutment².

An emergency drain has been provided for dewatering the reservoir. The control for the gate valve is located 50 feet upstream of the principal spillway. This gate controls the entrance to a BCCMP that drains into the bottom of the principal spillway riser.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the 100-year flood was selected as the spillway design flood (SDF). The spillways are capable of passing 100 percent of the SDF without overtopping the crest of the dam; therefore, they are adjudged as adequate. The spillways are capable of passing up to 21 percent of the PMF (Probable Maximum Flood) without overtopping the crest.

¹Measured from the streambed at the downstream toe of the dam to the minimum top of dam.

²Facing downstream.

NAME OF DAM: COBURN DAM

A formal warning system and emergency action plan should be developed and put into operation as soon as possible.

Regular, formal inspections should be made of the dam and appurtenant structures. A check list should be compiled for use by the owner's representative as a guide for the inspections. Maintenance items should be completed annually.

The following repair items should be accomplished as part of the general maintenance of the dam:

- 1) Remove all small trees and brush growing on the embankment.
- 2) Backfill, compact, regrade, and reseed all eroded areas on the embankment. A good grass cover should be established and the embankment mowed regularly.
- 3) Place riprap on the upstream embankment to minimize erosion due to wave action.
- 4) Riprap the stilling basin at the principal spillway outlet.
- 5) Reseed and establish a good vegetation cover on the left bank of the emergency spillway.
- 6) Reconnect the separated 5-foot section of 18-inch concrete conduit below the access road in the emergency spillway discharge channel, and backfill, compact, and reseed this eroded area.
- 7) Install a staff gage to monitor reservoir levels above normal pool.

NAME OF DAM: COBURN DAM

MICHAEL BAKER, JR., INC.

SUBMITTED:


Michael Baker, III, P.E.
Chairman of the Board and
Chief Executive Officer



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James A. Walsh, P.E.
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JACK G. STARR

RECOMMENDED:

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APPROVED:

Original signed by:
Douglas L. Haller
Douglas L. Haller
Colonel, Corps of Engineers
District Engineer

Date: APR 21 1981

NAME OF DAM: COBURN DAM



OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: COBURN DAM ID# VA 03340

SECTION 1 - PROJECT INFORMATION

1.1 General

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (Reference 12, Appendix IV). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Coburn Dam is an earthfill embankment 17.0 feet high¹ and approximately 350 feet long. The upstream embankment has an average slope of 2.3H:1V (Horizontal to Vertical). The left² half of the downstream embankment has a 15-foot wide bench about 10 feet below the dam crest. The upstream side of the bench contains a drainage ditch running parallel to the crest. From the crest of the dam, the left half of the downstream embankment slopes at 3.5H:1V to the drainage ditch. The bench borders the downstream side of the ditch, followed by the lower embankment, which slopes at 2.2H:1V to the toe of the dam. The right half of the downstream embankment has a slope of 2.2H:1V along its entire length. The

¹Measured from the streambed at the downstream toe of the dam to the minimum top of dam.

²Facing downstream.

NAME OF DAM: COBURN DAM

crest of the dam averages 26 feet in width. A crushed stone road runs along the crest of the dam. The minimum top of dam elevation, located at the right abutment, is 1004.7 feet Temporary Bench Mark (T.B.M.)³. No evidence of an internal drainage system or slope protection for the dam was found and there is no information available on a cut-off trench or zoning of embankment materials.

The principal spillway is comprised of two vertical sections of pipe. The first section is a 54-inch diameter bituminous coated corrugated metal pipe (BCCMP) riser with a crest elevation of 1000.0 feet T.B.M. Attached to this is a 2 1/2-foot section of 60-inch diameter BCCMP that extends the riser to elevation 1002.2 feet T.B.M. Water can enter the principal spillway at elevation 1000.0 feet T.B.M. by flowing between the two pipes, and at elevation 1002.2 feet T.B.M. by flowing over the 60-inch BCCMP. The inlet of the 60-inch pipe is protected by a trash screen with 1/2-inch diameter holes. Water entering the principal spillway is carried through the embankment in a 30-inch diameter BCCMP that extends 86 feet to the toe of the dam. The invert at the outlet of the pipe is at elevation 989.5 ft. T.B.M. Water exiting this pipe drops approximately 18 inches to a stilling basin at the toe of the dam.

An emergency drain has been provided for dewatering the reservoir. The control for the gate valve is located 50 feet upstream of the principal spillway. This gate valve controls the entrance to a 50-foot long 18-inch diameter BCCMP that drains into the bottom of the principal spillway riser.

The emergency spillway is a trapezoidal-shaped vegetated earth channel cut into the left abutment. The spillway is approximately 24 feet wide and has a crest elevation of 1002.2 feet T.B.M.

³All elevations are referenced to a Temporary Bench Mark (T.B.M.) located on the rim of the sanitary sewer manhole cover on the left abutment. The assumed elevation is 1004.7 feet.

NAME OF DAM: COBURN DAM

The reservoir is fed by runoff from a 0.33 square mile drainage area south and east of the dam. The drainage area contains the interchange of Interstate 95 and Virginia Route 207. The watershed consists of about one-half woodland and one-half cleared area. The watershed is composed of generally flat slopes.

1.2.2 Location: Coburn Dam is located in Caroline County, Virginia, approximately 1.5 miles northwest of Ruther Glen, Virginia. It is immediately west of Interstate 95 approximately one-half mile north of the intersection of I-95 and VA Route 207. The dam is located on an unnamed tributary to Polecat Creek. A Location Plan is included in Appendix I of this report.

1.2.3 Size Classification: Coburn Dam is 17.0 feet high and the reservoir storage at the crest of the dam (elevation 1004.7 feet T.B.M.) is 111 acre-feet. Therefore, the dam is in the "small" size category as defined by the Recommended Guidelines for Safety Inspections of Dams.

1.2.4 Hazard Classification: A 13-foot wide crushed stone road runs along the crest of the dam. This road provides access to a summer house located on the right abutment. A sewage treatment plant is located at the toe of the dam below the left side of the embankment. The downstream channel passes beneath Interstate 95 approximately one-half mile downstream and crosses under VA Route 652 approximately 2 miles downstream. Loss of human life in the event of dam failure is not considered highly probable. However, economic losses due to damage to the sewage treatment plant, the roadway across the crest of dam, and the bridges at Interstate 95 and VA Route 652 are probable in the event of dam failure. Coburn Dam is therefore considered to be in the "significant" hazard category as defined by the Recommended Guidelines for Safety Inspections of Dams. The hazard classification used to categorize dams is a function of location only and is not related to stability or probability of failure.

NAME OF DAM: COBURN DAM

1.2.5 Ownership: The dam is owned by the Ramada Inn, Box 104, Ruther Glen, Virginia, represented by Mr. Paul Walfield, co-owner and manager.

1.2.6 Purpose: Coburn Dam is used for recreational purposes.

1.2.7 Design and Construction History: The dam was constructed in 1974 by George Viea. No other information on design or construction history was available for use in this report.

1.2.8 Normal Operating Procedures: The reservoir level is maintained automatically by the crest of the 54-inch BCCMP of the principal spillway (elevation 1000.0 feet T.B.M.). No formal operating procedures are followed for this structure.

1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area tributary to Coburn Dam is 0.33 square miles.

1.3.2 Discharge at Dam Site: The maximum discharge from the reservoir is unknown.

Pool level at minimum top of dam:
Principal Spillway 66 c.f.s.
Emergency Spillway 260 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are provided in the following table:

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TABLE 1.1 DAM AND RESERVOIR DATA

Item	Elevation (feet T.B.M.)	Area (acres)	Reservoir Capacity			Length (feet)
			Acre- feet	Watershed (inches)		
Top of Dam (minimum)	1004.7	10.8	111	6.31	1800	
Emergency Spillway Crest	1002.2	9.9	85	4.83	1600	
Principal Spillway Crest	1000.0	9.2	64	3.64	1500	
Streambed at downstream toe of dam	987.7	-	-	-	-	-

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SECTION 2 - ENGINEERING DATA

- 2.1 Design: Design plans, specifications, and boring logs were not available for use in preparing this report. No stability analyses or hydrologic and hydraulic data were available for review.
- 2.2 Construction: Construction records, as-built plans, and inspection logs were not available for review.
- 2.3 Evaluation: No design or construction records were available for use in assessing the condition of the dam. All evaluations and assessments in this report were based upon field observations, conversations with representatives of the owner, and office analyses.

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SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The field inspection was conducted on 14 January 1981. At the time of the inspection, the pool elevation was 1000.0 feet T.B.M., and the tailwater elevation was 988.2 feet T.B.M. The weather was cold and overcast with the temperature at 25 degrees Fahrenheit. The ground surface of the embankment and abutments was generally dry. The dam and appurtenant structures were found to be in fair overall condition at the time of inspection. Deficiencies found during the inspection will require remedial treatment. The following are brief summaries of these deficiencies. A field sketch of conditions found during the inspection is presented as Plate 1 in Appendix I, and the complete visual inspection check list is included as Appendix III. No record of any previous inspections was found.

3.1.2 Dam: The embankment was found to be in generally fair condition. The embankment is constructed of a highly erodible, silty fine sand. Minor hairline surface cracks were observed on the crest and downstream edge of the crest near the center and right-center of the embankment. There is slight surface cracking at the toe of the dam near the right-center of the embankment. The downstream embankment is severely to moderately eroded. There are many erosion gullies 6 inches to 2 feet deep on the downstream face, particularly on the right side of the embankment. One gully is 3 to 4 feet deep on the right-center of the downstream face. The left half of the downstream embankment has a 15-foot wide bench about 10 feet below the dam crest. The slope below the bench contains several erosion gullies up to 4 feet deep. There is a very large erosion gully at the junction of the bench and the upper slope, running parallel to the dam. This gully is 10 feet deep where it empties into the discharge pool of the principal spillway. The upstream embankment

NAME OF DAM: COBURN DAM

has been moderately eroded from precipitation, runoff and wave action, particularly in the left-center region. There was no riprap observed on the upstream embankment, and the vegetative cover consisted of small brush, briars, and weeds.

An area downstream from the right abutment has been slightly eroded. This erosion is probably the result of natural drainage. There was no seepage noted from the embankment. Slow drainage of about 5 g.p.m. was observed near the right abutment. This drainage appears to be a natural spring.

Although a sanitary sewer line apparently runs the length of the dam about 15 feet below the embankment crest, there is no evidence that this line collects internal drainage from the dam.

3.1.3

Appurtenant Structures: The appurtenant structures appear to be in fair overall condition.

The principal spillway riser and accompanying gate (as described in Section 1.2.1) appear to be in operable condition. However, the discharge area of the principal spillway is in need of repair. The outlet pipe extends, unsupported, about 4.5 feet from the embankment. This portion of the embankment appears to have been eroded from around the pipe. The outlet pipe discharges into an extremely eroded pool about five feet deep and fifteen feet in diameter. Three sides of the pool have steep, bare, and eroded banks. At the downstream end of the pool, water discharges into a vegetation-choked discharge channel.

The emergency spillway (as described in Section 1.2.1) is in fair condition. The approach channel of the emergency spillway is well vegetated. The spillway generally follows a crushed stone road. The left bank of the spillway is a 10-foot high, steeply eroded and barren bank. The access road to the sewage treatment plant crosses the spillway discharge channel approximately 150 feet

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downstream of the entrance of the emergency spillway approach channel. This road partially obstructs the channel. An 18-inch diameter concrete pipe crosses under the road to allow runoff and small flows in the emergency spillway to pass under the road. This concrete pipe discharges into a 5-foot deep eroded gully. On the downstream side of the road, the last section of concrete conduit has separated, due to erosion. The emergency spillway, with the exception of the access road across the discharge channel, is free from debris and is unobstructed.

3.1.4 Reservoir Area: The slopes surrounding the reservoir are very gentle. The drainage area for the reservoir includes the Ramada Inn property and the interchange of Interstate 95 and VA Route 207. The extent of sedimentation within the reservoir was not directly observed, but it is not expected to be significant. Soundings at the time of inspection indicated the depth of the reservoir to be about 7.5 feet at about 30 feet offshore from the embankment.

3.1.5 Downstream Channel: The downstream channel beyond the immediate discharge area is broad and swampy with a very low gradient. It is about 400 feet wide and has moderately sloping, tree-covered banks.

3.1.6 Instrumentation: There was no instrumentation at the dam site at the time of inspection.

3.2 Evaluation: In general, the dam and appurtenant structures were found to be in fair overall condition. All areas of erosion on the embankment should be backfilled, compacted, regraded, and reseeded. A good grass cover should be established over the entire embankment. The small trees growing on the embankment should be removed and the embankment mowed regularly. Riprap should be placed on the upstream embankment to minimize erosion. The eroded area of the stilling basin at the outlet of the principal spillway should be backfilled, compacted, and riprap placed in the area to prevent future erosion.

NAME OF DAM: COBURN DAM

A good vegetation cover should be established on the left bank of the emergency spillway. The separated 5-foot section of 18-inch concrete conduit in the emergency spillway discharge channel should be reconnected and the area backfilled, compacted, and reseeded.

A staff gage should be installed to monitor reservoir levels above normal pool.

NAME OF DAM: COBURN DAM

SECTION 4 - OPERATIONAL PROCEDURES

- 4.1 Procedures: Operation of the dam is an automatic function controlled by the principal spillway and the emergency spillway on the left abutment. Water entering the reservoir flows into the 54-inch diameter principal spillway riser at elevation 1000.0 feet T.B.M. When the inflow is sufficient to raise the reservoir level above elevation 1002.2 feet T.B.M., flow discharges into the principal spillway by dropping over the 60-inch BCCMP at the top of the principal spillway riser. When the reservoir level rises above elevation 1002.2 feet T.B.M., water will also discharge through the emergency spillway on the left abutment.
- 4.2 Maintenance of Dam: Maintenance of the dam is the responsibility of the owner. An inspection and maintenance schedule has not been instituted.
- 4.3 Maintenance of Operating Facilities: The only operating facility at the dam at the time of inspection was the emergency drain. The maintenance of this operating facility is the responsibility of the owner. An inspection, testing or maintenance schedule has not been instituted.
- 4.4 Warning System: At the time of inspection, there was no warning system or emergency action plan in operation.
- 4.5 Evaluation: Maintenance of the dam in the past has been inadequate. Regular inspections of the dam and appurtenant structures should be made and documented. A thorough check list should be compiled for use by the owner's representative as a guide for the inspections. Maintenance items should be corrected annually. In addition, a formal warning system and emergency action plan should be developed and put into operation as soon as possible.

NAME OF DAM: COBURN DAM

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: No design data were available for use in preparing this report.

5.2 Hydrologic Information: No rainfall, stream gage or reservoir stage records are maintained for this dam.

5.3 Flood Experience: No records were available.

5.4 Flood Potential: The Probable Maximum Flood (PMF), 1/2 Probable Maximum Flood (1/2 PMF), and 100-year flood were developed and routed through the reservoir by use of the HEC-1 DB computer program (Reference 9, Appendix IV) and appropriate unit hydrograph, precipitation and storage-outflow data. Clark's T_c and R coefficients for the local drainage areas were estimated from basin characteristics. The rainfall applied to the unit hydrograph was taken from publications by the U.S. Weather Bureau and the National Oceanic and Atmospheric Administration (References 16 and 17, Appendix IV). Rainfall losses for the PMF and 1/2 PMF were estimated at an initial loss of 1.0 inches and a constant loss rate of 0.05 inches per hour thereafter. Rainfall losses for the 100-year flood were estimated at an initial loss of 1.5 inches and a constant loss rate of 0.15 inches per hour thereafter.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are provided in Table 1.1, Paragraph 1.3.3.

Regulation of flow from the reservoir is automatic. Normal flows are maintained by the crest of the 54-inch diameter principal spillway riser at elevation 1000.0 feet T.B.M. When the reservoir level rises, water also enters the principal spillway at elevation 1002.2 feet T.B.M. by flowing over the crest of the 60-inch diameter BCCMP. Water can also discharge through the emergency spillway located on the left abutment when the reservoir level exceeds 1002.2 feet T.B.M.

Outlet discharge capacity was computed by hand; reservoir area was estimated from the Ruther Glen, Virginia 7.5 minute USGS quadrangle; and storage capacity was computed by the HEC-1 DB program. Outlet discharge capacity and storage capacity curves were computed to elevations above the crest of the dam. All flood routings were begun with the reservoir at normal pool. Flow through the principal spillway and emergency spillway was included in the routings.

NAME OF DAM: COBURN DAM

5.6 Overtopping Potential: The probable rise of the reservoir and other pertinent information on the reservoir performance are shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal ¹	Hydrographs		
		100-year flood	1/2 PMF	PMF ²
Peak flow, c.f.s.				
Inflow	0.033	754	1966	3,932
Outflow	0.033	208	1828	3,795
Peak elev., ft. T.B.M.	1000.0	1004.0	1006.1	1007.0
Emergency spillway ³ (elev. 1002.2 ft. T.B.M.)				
Depth of flow, ft.	-	1.8	3.9	4.8
Average velocity, f.p.s.	-	7.6	11.2	12.4
Duration of flow, hrs.	-	4.2	13.7	21.7
Non-overflow section ³ (elev. 1004.7 ft. T.B.M.)				
Depth of flow, ft.	-	-	1.4	2.3
Average velocity, f.p.s.	-	-	5.5	7.03
Total duration of over- topping, hrs.	-	-	1.9	4.1
Tailwater elev., ft. T.B.M.	988.2	-	-	-

¹Conditions at time of inspection.

²The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in a region.

³Velocity estimates were based on critical depth at control section.

5.7 Reservoir Emptying Potential: The reservoir can be drawn down by means of the 18-inch emergency drain. Neglecting inflow, the reservoir can be drawn down from normal pool in approximately 4.25 days. This is equivalent to a drawdown rate of 1.9 feet per day, based on the hydraulic height measured from normal pool divided by the time required to dewater the reservoir.

5.8 Evaluation: Coburn Dam is a "small" size - "significant" hazard dam requiring evaluation for a spillway design flood (SDF) in the range between the 100-year flood and the 1/2 PMF. Due to the risk involved, the 100-year flood was selected as the SDF. The spillways are capable of passing the SDF without overtopping the

NAME OF DAM: COBURN DAM

crest of the dam. The spillways are capable of passing up to 21 percent of the PMF without overtopping the dam.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

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SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: Coburn Dam is located in the Atlantic Coastal Plain geologic region near the boundary of the Piedmont region. The area of the dam appears to be underlain by the Calvert formation of Tertiary age, according to the Geologic Map of Virginia. The Calvert formation typically consists of unconsolidated sandy clay and fine-grained sand. Exposed soils in the left abutment and downstream areas were observed to consist of buff to reddish-brown clayey sands. No previous information describing local subsurface conditions was available for the visual inspection or subsequent analyses. It is not known how the dam was keyed into the foundation and abutments.

6.2 Embankment

6.2.1 Materials: Information describing the nature of the embankment materials or any zoning within the dam was not available for this inspection. During the visual inspection, the outer embankment materials were noted as consisting of reddish-brown clayey fine sand similar to the soils observed in the abutment and downstream areas. A large shallow excavated area was observed on the right slope of the downstream channel about 200 to 300 feet from the dam. This excavation may have served as a source of borrow material for the embankment. The embankment soils contained a high proportion of low plastic fine sand and silt and appeared to be highly erodible.

6.2.2 Stability: Design plans and the results of a previous stability analysis were not available for use during this evaluation. The embankment is assumed to be a homogeneous type. The dam is 17.0 feet high with a crest width of 26 feet. The upstream embankment has an average slope of 2.3H:1V. The left half of the downstream embankment has a 15-foot wide bench about 10 feet below the dam crest. The upstream side of the bench contains a drainage ditch running parallel to the crest. From the crest of the dam, the left half of the downstream embankment slopes at 3.5H:1V to the drainage ditch. The bench borders the downstream side of the ditch, followed by the

NAME OF DAM: COBURN DAM

lower embankment, which slopes at 2.2H:1V to the toe of the dam. The right half of the downstream embankment has a slope of 2.2H:1V along its entire length.

In the event of an emergency, the reservoir can be drawn down due to the availability of an emergency gate and 18-inch diameter drain. According to calculations made as part of this investigation, the dam is subject to a rapid drawdown since the reservoir will drop 1.9 feet per day, which exceeds the critical rate for earth dams of 0.5 feet per day.

According to guidelines set forth in Design of Small Dams by the U.S. Department of the Interior, Bureau of Reclamation, the upstream slope of a small homogeneous dam constructed of predominantly sandy soils of low plasticity (SC or SM soils according to the USCS classification system), with a stable foundation, should be 3.0H:1V if subject to rapid drawdown. The recommended downstream slope is 2.0H:1V. A crest width of 13.4 feet is recommended, considering the height of the dam of 17 feet. Based on these guidelines, the upstream slope is inadequate while the crest width and downstream slopes are generally adequate.

Major signs of instability in the embankment such as slumping, large tension cracks, or unusual alignment along the crest were not observed during the visual inspection. Slight cracking along the crest and at the toe appeared to be superficial and most likely is not serious. No signs of seepage were observed on the embankment or in the foundation below the downstream face. However, severe erosion had taken place near the downstream toe of the dam in the area of the outlet discharge and on an adjacent area of the bench of the left downstream face. Other areas of erosion were present on both the upstream and downstream faces as discussed in Section 3.

6.2.3 Seismic Stability: The dam is located in Seismic Zone 1, which presents no hazard from earthquakes, according to the Recommended Guidelines for Safety Inspection of Dams by

NAME OF DAM: COBURN DAM

the Department of the Army, Office of the Chief of Engineers. This determination is contingent on the requirements that static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: The results of a previous stability analysis were not available for review as part of this evaluation. The downstream slope is flatter than recommended and is benched on the left half of the dam. The upstream slope is steeper than the recommended slope of 3.0H:1V. The crest width is almost 13 feet wider than recommended in the Bureau of Reclamation guidelines. Signs of instability were generally absent during the visual inspection and a stability check is not considered to be necessary. However, areas of severe erosion of the downstream face could potentially affect the stability of the dam in the future and require remedial action (see Section 7).

As described in Section 5, the spillways are capable of passing the SDF without overtopping the crest of the dam. Therefore, overtopping flows are not considered detrimental to the stability of the embankment.

NAME OF DAM: COBURN DAM

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: There were no engineering data available for use in preparing this report. Deficiencies discovered during the field inspection and office analyses require remedial treatment. The dam and appurtenant structures are generally in fair overall condition. Maintenance of the dam is considered inadequate. A stability check of the dam is not required.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the 100-year flood was selected as the SDF for the "small" size - "significant" hazard classification of Coburn Dam. The spillways are capable of passing 100 percent of the SDF without overtopping the crest of the dam and are adjudged as adequate. The spillways are capable of passing up to 21 percent of the PMF without overtopping the crest of the dam.

There is no flood warning system or emergency action plan currently in operation.

7.2 Recommended Remedial Measures: A formal warning system and emergency action plan should be developed and put into effect as soon as possible.

Regular, formal inspections should be made of the dam and appurtenant structures. A check list should be compiled for use by the owner's representative as a guide for the inspections. Maintenance items should be completed annually.

The following repair items should be accomplished as part of the general maintenance of the dam:

- 1) Remove all small trees and brush growing on the embankment.
- 2) Backfill, compact, regrade and reseed all eroded areas on the embankment. A good grass cover should be established and the embankment mowed regularly.
- 3) Place riprap on the upstream embankment to minimize erosion due to wave action.
- 4) Riprap the stilling basin at the principal spillway outlet.

NAME OF DAM: COBURN DAM

- 5) Reseed and establish a good vegetation cover on the left bank of the emergency spillway.
- 6) Reconnect the separated 5-foot section of 18-inch concrete conduit below the access road in the emergency spillway discharge channel, and backfill, compact and reseed this eroded area.
- 7) Install a staff gage to monitor reservoir levels above normal pool.

NAME OF DAM: COBURN DAM

APPENDIX I

PLATES

CONTENTS

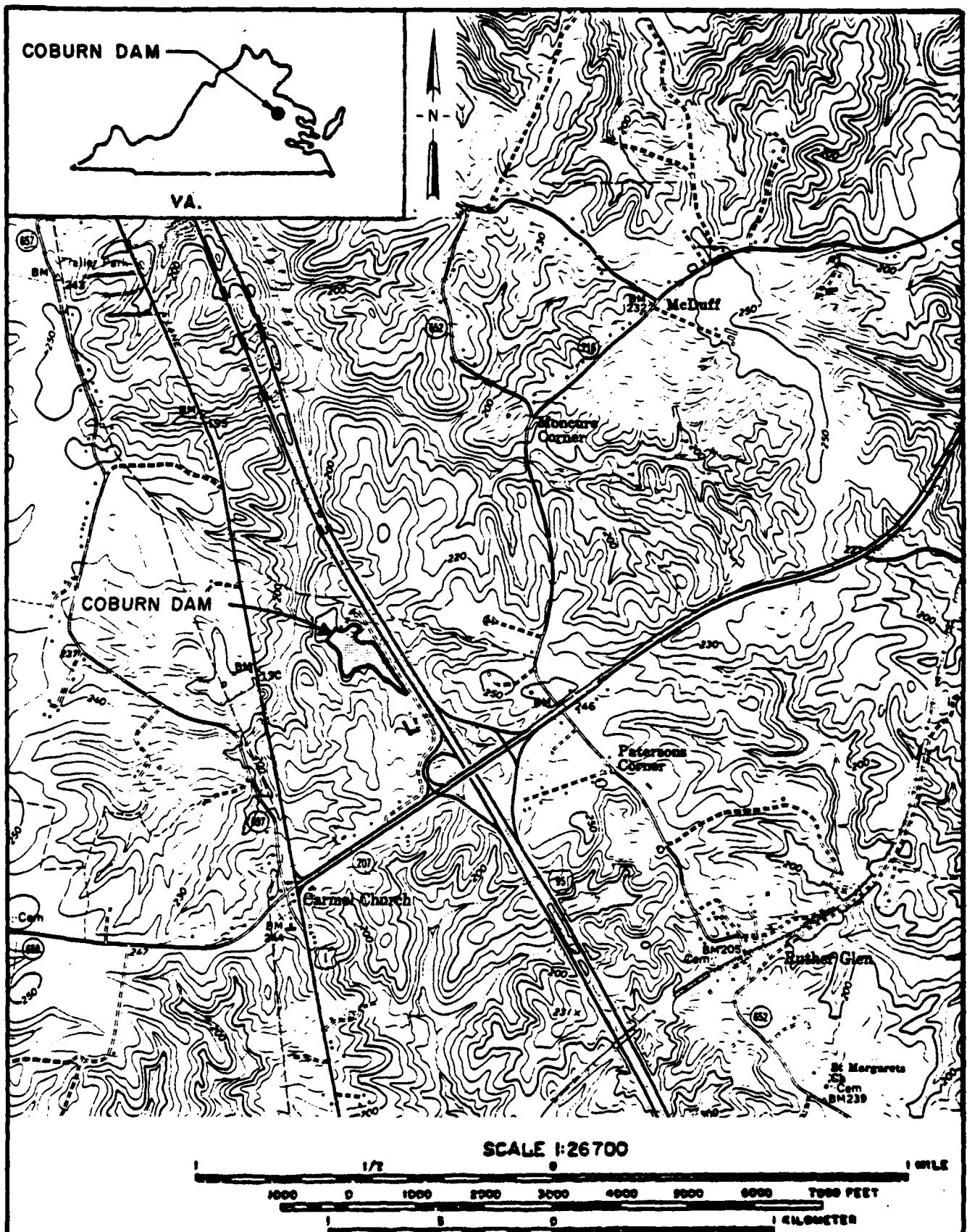
Location Plan

Plate 1: Field Sketch

Plate 2: Top of Dam Profile

Plate 3: Typical Cross Sections

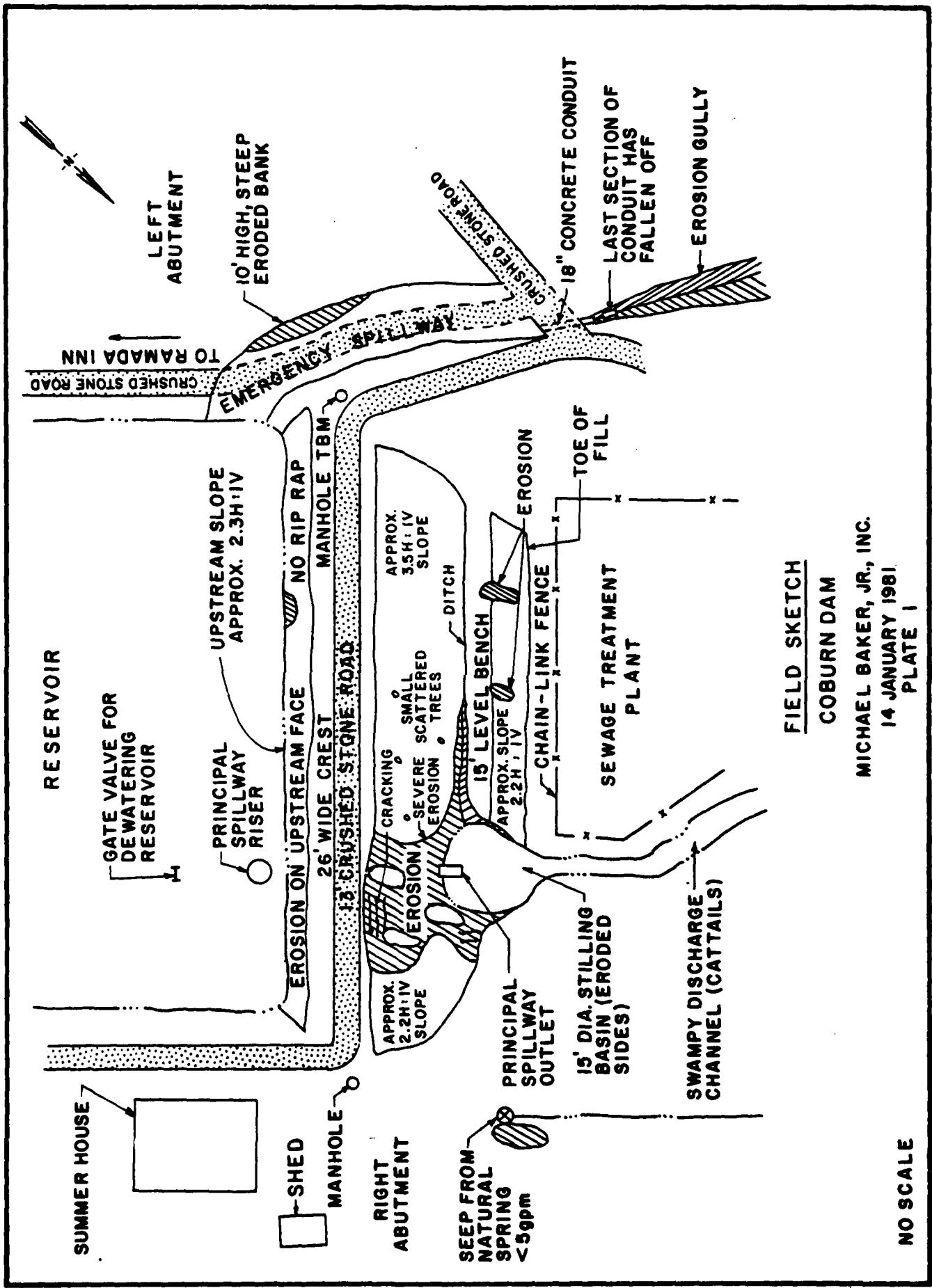
NAME OF DAM: COBURN DAM



REFERENCES:

REFERENCES:
1. U.S.G.S. 7.5' RUTHER GLEN, VA.
QUADRANGLE. PHOTOREVISED 1974

LOCATION PLAN
COBURN DAM



MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject VIRGINIA Dams

S.O. No. _____

Cuburn Dam

Sheet No. _____ of _____

Top of Dam Profile

Drawing No. _____

Computed by _____ Checked by _____

Date _____

TOP OF DAM PROFILE LOOKING DOWNSTREAM

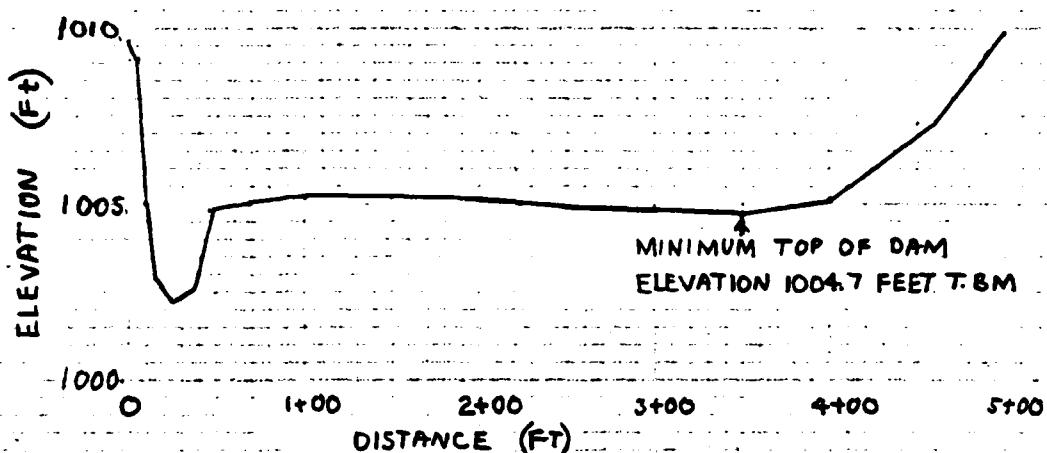


PLATE 2

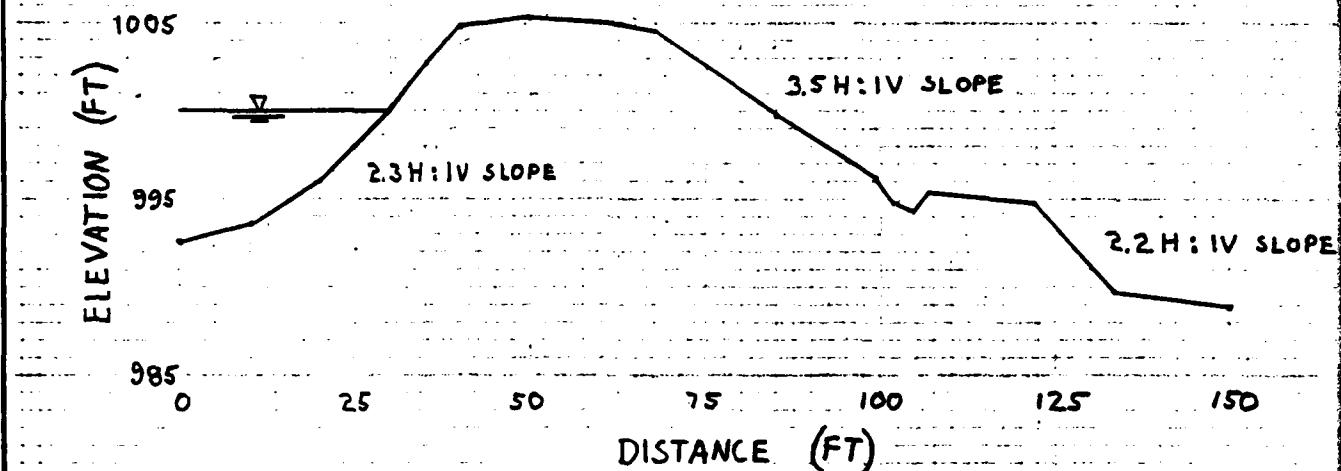
MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject: VIRGINIA DAMS S.O. No. _____
Coburn Dam Sheet No. _____ of _____
Drawing No. _____
Computed by _____ Checked by _____ Date _____

DAM CROSS SECTION AT STA 1+50

CREST WIDTH = 26 FEET



DAM CROSS SECTION AT OUTLET WORKS
STA 2+20

CREST WIDTH = 25 FEET

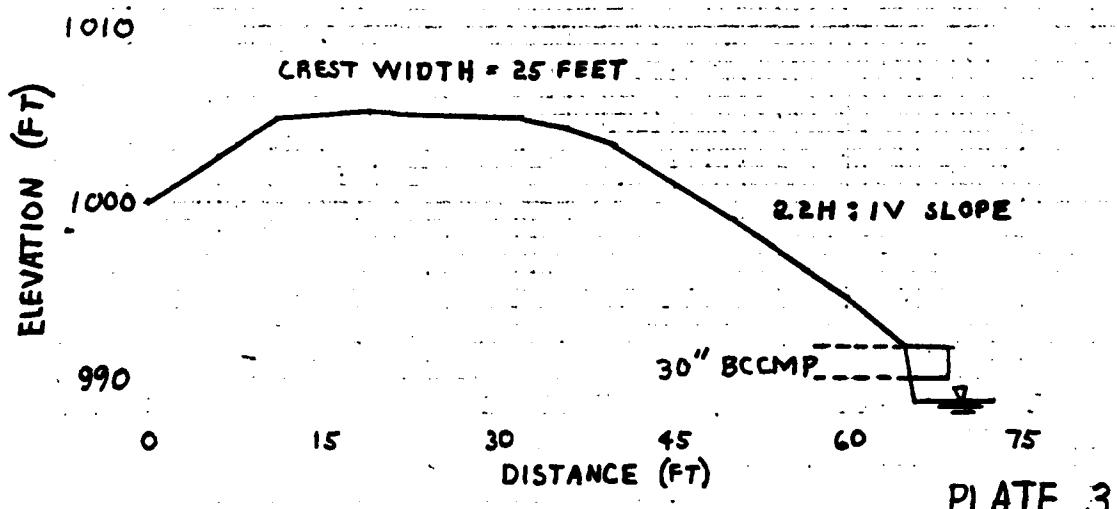


PLATE 3

APPENDIX II
PHOTOGRAPHS

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- Photo 1: Principal Spillway Intake Riser and Control for Reservoir Drain
- Photo 2: Outlet of Principal Spillway Showing Erosion of Stilling Basin
- Photo 3: Erosion of Upstream Embankment - House on Right Abutment in Background
- Photo 4: Erosion on Right Side of Downstream Embankment
- Photo 5: Emergency Spillway Looking Downstream
- Photo 6: Access Road to Sewage Treatment Plant Crossing Emergency Spillway Discharge Channel to Left of Photo
- Photo 7: Erosion of Lower Bench on Left Side of Embankment
- Photo 8: Sewage Treatment Plant Located at Toe of Dam on Left Side of Embankment

Note: Photographs were taken on 14 January 1981.

NAME OF DAM: COBURN DAM

COBURN DAM



PHOTO 1. Principal Spillway Intake Riser and Control for Reservoir Drain



PHOTO 2. Outlet of Principal Spillway Showing Erosion of Stilling Basin

COBURN DAM



**PHOTO 3. Erosion of Upstream Embankment - House on Right
Abutment in Background**



PHOTO 4. Erosion on Right Side of Downstream Embankment

COBURN DAM



PHOTO 5. Emergency Spillway Looking Downstream



PHOTO 6. Access Road to Sewage Treatment Plant Crossing Emergency Spillway Discharge Channel to Left of Photo

COBURN DAM

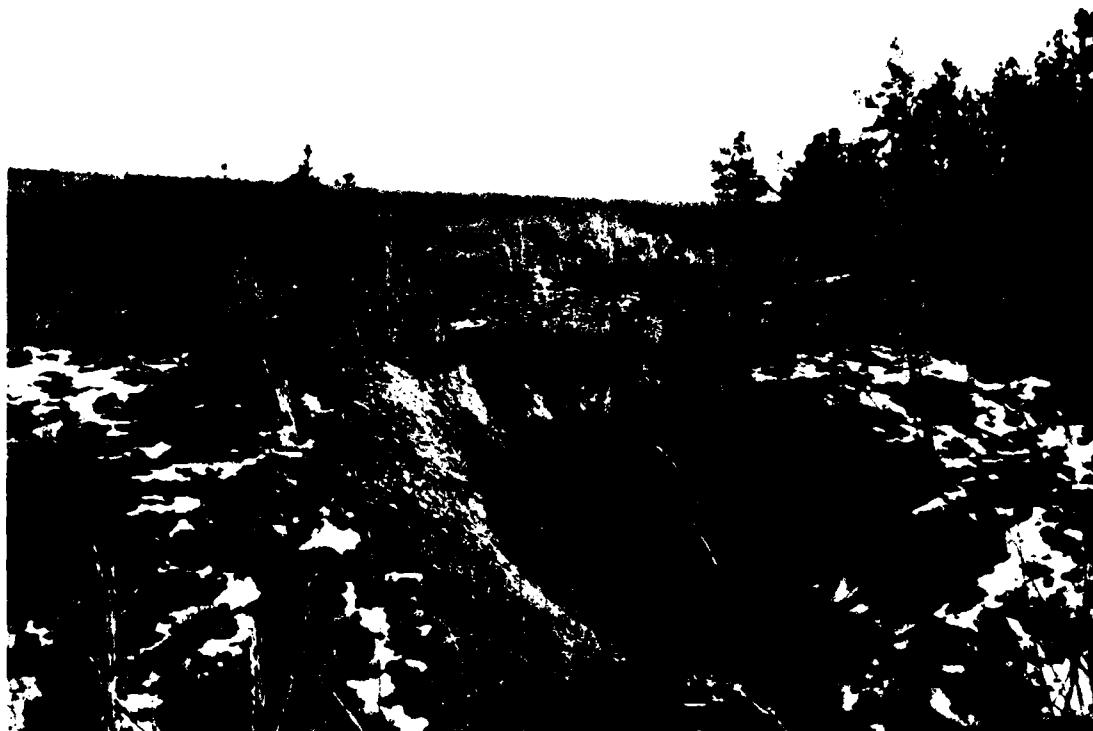


PHOTO 7. Erosion of Lower Bench on Left Side of Embankment



**PHOTO 8. Sewage Treatment Plant Located at Toe of Dam
on Left Side of Embankment**

APPENDIX III
VISUAL INSPECTION CHECK LIST

Check List
Visual Inspection
Phase 1

Name of Dam	Coburn Dam	County	Caroline	State	Virginia	Coordinates	Lat.	3756.5
							Long.	7728.8
Date of Inspection	14 January 1981	Weather	Cloudy, cold			Temperature	30° F.	

Pool Elevation at Time of Inspection 1000.0 ft. T.B.M.* Tailwater at Time of Inspection 988.2 ft. T.B.M.
*All elevations are referenced to a Temporary Bench Mark (T.B.M.) located on the rim of the sanitary
sewer manhole cover on the left abutment. The assumed elevation is 1004.7 ft.

Inspection Personnel:

Michael Baker, Jr., Inc.:

Stephen Shoemaker
Anthony Klimek
David Meredith

Owner's Representatives:

Mr. Bert Walfield

Virginia State Water Control Board:

Edwin B. Constantine, III

Stephen Shoemaker Recorder

Name of Dam COBURN DAM

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Minor surface cracks on the surface and downstream edge of the crest near the center and right center of the embankment were observed.	The surface cracks are not considered to be serious.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	There is slight surface cracking at the toe of the dam near the right-center of the embankment. There is no noticeable bulging associated with this, and it does not appear to involve movement.	The cracking is not considered to be serious.
SLoughing OR Erosion OF EMBANKMENT AND ABUTMENT SLOPES	The embankment is constructed of a highly erodible, silty fine sand. The downstream embankment is moderately to severely eroded. There are many erosion gullies 6 in. to 2 ft. deep on the downstream face, particularly on the right side of the embankment. One gully is 3 to 4 ft. deep on the right center of the downstream face. The left half of the downstream embankment has a 15 ft. wide bench about 10 ft. below the dam crest. The slope below the bench contains several erosion gullies up to 4 ft. deep. There is a	All areas of erosion on the embankment should be back-filled, compacted, regraded and reseeded to establish a good grass cover over the entire embankment. Riprap should be placed on the upstream embankment to minimize erosion due to wave action.

Name of Dam COBURN DAM

EMBANKMENT

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

**SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES (continued)**

very large erosion gully at the junction of the bench and the upper slope, running parallel to the dam. This gully is 10 ft. deep where it empties into the discharge pool of the principal spillway. The upstream embankment has been moderately eroded from precipitation, runoff and wave action, particularly in the left region.

**VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST**

A crushed stone roadway runs along the crest of the dam. The top of dam elevation varies approximately 0.6 ft. along the crest of the dam. The horizontal alignment appears to be satisfactory.

RIPRAP FAILURES

There is no riprap on the dam.

Riprap should be placed on the upstream embankment to minimize erosion.

VEGETATION

sparse grassy vegetation and small trees are on the downstream embankment. There is woody brush and weeds growing near the waterline of the upstream embankment.

All trees and brush growing on the embankment should be removed. A good grass cover should be established over the entire embankment.

EMBANKMENT

Name of Dam COBURN DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	<p>The left abutment area contains an emergency spillway that generally follows a crushed stone access road. Erosion was observed at the left abutment on the left bank of the emergency spillway. The left side of the spillway has been eroded to a steep 10 ft. bank. The right abutment is at about the same elevation as the embankment crest. Natural drainage downstream from the right abutment has created an area of slight erosion, but this does not appear to affect the embankment.</p>	<p>A good grass cover should be established on the left bank of the emergency spillway. The erosion area at the right abutment should be backfilled, compacted and reseeded.</p>
ANY NOTICEABLE SEEPAGE	<p>There was no seepage noted in the embankment. Slow drainage of about 5 g.p.m. was observed near the right abutment. This area appears to be a natural spring.</p>	
STAFF GAGE AND RECORDER	<p>None</p>	<p>A staff gage should be installed to monitor reservoir levels above normal pool.</p>

DRAINS

No evidence of a drainage system for the embankment was observed during the inspection.

Name of Dam COBURN DAM

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
OTHER	<p>An 8 in. diameter sanitary sewer line, approximately 320 ft. long, runs longitudinally along the length of the dam with a manhole located at each abutment. The manhole at the right abutment has 3 inlets which are intentionally plugged and one outlet which is heavily silted with sand and clay. This manhole is about 10 ft. deep. The manhole located on the left abutment is 15 ft. deep. It has one inlet which handles the flow of sewage from the Ramada Inn, located upstream from the dam, and a clogged inlet from the manhole, located on the right abutment. The manhole on the left abutment drains to a sewage treatment plant located at the toe below the left side of the embankment. There is no evidence that these sewer lines drain the embankment.</p>	<p>The outer embankment materials were noted as consisting of reddish-brown clayey fine sand similar to the soils observed in the abutment and downstream areas. The embankment soils contained a high proportion of low plastic fine sand and silt and appeared to be highly erodible. The ground surface at the embankment and abutment was generally dry.</p>
EMBANKMENT MATERIALS		

Name of Dam: COBURN DAM

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The outlet conduit is a 30 in. BCCMP that discharges through the embankment to a basin at the toe of the dam near the right-center of the embankment.	Other than minor rust and some deterioration of the protective coating, the riser appears to be in good condition and working order.
INTAKE STRUCTURE	The intake structure is located 19 ft. from the shoreline (at the time of inspection). It is comprised of 2 BCCMPs. A 54 in. diameter BCCMP extends from the reservoir bottom to the normal reservoir level. Connected to the top of this pipe by brackets is a 30 in. long, 5 ft. diameter BCCMP. This second pipe starts 3 in. below the crest of the 54 in. pipe and extends 27 in. (at the time of inspection) out of the water. There is a screen with 1/2 in. diameter holes at the top of the 5 ft. diameter riser extension. At the bottom of this intake structure is the inlet pipe from an emergency drain; the valve is located in the reservoir 50 ft. upstream from the intake structure. This inlet pipe appears to be an 18 in. BCCMP.	Other than minor rust and some deterioration of the protective coating, the riser appears to be in good condition and working order.
OUTLET STRUCTURE	A 30 in. diameter BCCMP extends through the dam and protrudes from the embankment about 4.5 ft. where it discharges into a pool at the toe of the dam. At the time of inspection, the rate of discharge was about 15 g.p.m. as measured with	

OUTLET WORKS

Name of Dam: COBURN DAM

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
OUTLET STRUCTURE (continued)	<p>a bucket. There was some deterioration of the protective coating of the outlet pipe, however, no rust was observed. There appeared to be no seepage around the outside of the pipe. The area around the pipe is severely eroded into the embankment of the dam.</p>	<p>The eroded area around the outlet pipe should be back-filled, compacted and riprap placed in the area to minimize erosion.</p>
OUTLET CHANNEL	<p>The outlet pipe extends unsupported about 4.5 ft. from the eroded face of the embankment. Water from the outlet pipe drops about 18 in. to an extremely eroded basin about 5 ft. deep and 15 ft. in diameter. Three sides of the basin have steep, bare and eroded banks. At the downstream end of the basin, water discharges into a vegetation-choked discharge channel that flows by the sewage treatment plant located at the toe of the dam below the left embankment.</p>	
EMERGENCY GATE		<p>There is a hand operated gate located on the reservoir (70 ft. from shore) that controls the drawdown of the reservoir. This control is in line with the intake structure and the outlet conduit. This gate controls a valve which allows water to flow through an 18 in. BCCMP to the principal spillway riser and out the principal spillway conduit. The gate was closed and not operated at the time of inspection. Due to ice on the reservoir, the gate could not be investigated in detail.</p>

EMERGENCY SPILLWAY

Name of Dam: COBURN DAM

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	Not Applicable	
APPROACH CHANNEL	The emergency spillway approach channel is a well vegetated grass-lined trapezoidal channel.	
DISCHARGE CHANNEL	The spillway generally follows a crushed stone access road. The left side of the spillway is a 10 ft. high steeply eroded and barren bank. The access road to the sewage treatment plant crosses through the spillway discharge channel about 150 ft. below the spillway entrance. This road partially obstructs the channel. An 18 in. diameter concrete conduit crosses under the road to allow runoff and small flows through the emergency spillway to pass under the road. This concrete conduit extends 67.5 ft. and discharges into a 5 ft. deep eroded gully. The last 5 ft. section of concrete conduit has separated, due to erosion from underneath the pipe.	A good vegetation cover should be established on the left bank of the emergency spillway. The last 5 ft. section of pipe that has fallen off should be reconnected and the area around the outlet backfilled, compacted and reseeded.
BRIDGE AND PIERS	Not Applicable	

INSTRUMENTATION		REMARKS OR RECOMMENDATIONS
VISUAL EXAMINATION	OBSERVATIONS	
MONUMENTATION/SURVEYS	None observed	
OBSERVATION WELLS	None observed	
WEIRS	None	
PIROMETERS	None	
OTHER		

Name of Dam: COBURN DAM

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Generally, there is very little relief along the reservoir. I-95 bounds the reservoir to the east. The drainage area for the reservoir includes I-95, the interchange of I-95 and VA Route 207, and the Ramada Inn and parking lot. Drainage from I-95 enters the reservoir through concrete culverts at three locations.	I-95 is being expanded from 2 to 3 lanes at this time. This construction might affect the hydrology of this area in the future.
SEDIMENTATION	Sedimentation was noticeable at the I-95 culverts. The extent of sedimentation within the reservoir was not directly observed; however, it is not expected to be significant. The reservoir was determined to be 7.5 ft. deep at a distance 30 ft. off shore near the center of the embankment.	

Name of Dam: COBURN DAM

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	A sewage treatment plant and fill material are located at the toe of the dam below the left embankment. There is a borrow area scooped out of the bank below the right embankment. The channel discharges into a stream about 400 ft. below the dam. The stream is broad and swampy with dead trees and marsh vegetation.	Large flows downstream could possibly damage the sewage treatment plant. In the event of dam failure, loss of human life is not considered highly probable. However, damage to the sewage treatment plant, the access road on the crest of the dam, and bridges at I-95 and VA Route 652 is considered probable and could constitute an economic loss.
SLOPES	The downstream channel has a very low gradient. It is about 400 ft. wide down to I-95. The banks are moderately sloping and tree covered.	
APPROXIMATE NO. OF HOMES AND POPULATION	There is a single story summer house on the right abutment. The floor of this house is at the same elevation as the minimum top of dam. There are no homes in the downstream area. The sewage treatment plant for the Ramada Inn is located at the toe of the dam below the left embankment less than 5 ft. above the downstream streambed elevation. I-95 is located about 1/2 mi. downstream and VA Route 652 is located about 2 mi. downstream.	

APPENDIX IV
GENERAL REFERENCES

GENERAL REFERENCES

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